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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Hiroaki Misawa

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WENDEROTH, LIND & PONACK, L.L.P.

1030 15th Street, N.W.,

Suite 400 East

Washington, DC 20005-1503

EXAMINER

DUCLAIR, STEPHANIE P.

ART UNIT

PAPER NUMBER

4171

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/585,845	Applicant(s) MISAWA ET AL.	
	Examiner STEPHANIE DUCLAIR	Art Unit 4171	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07/12/2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>07/12/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This is the first action on the merits.
2. Preliminary amendment filed on 07/12/2006 has been entered and fully considered.
3. Claims 1-6 are pending before the Office for review, of which 1-6 are amended, and no new matter has been added.

Priority

4. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in **Japan** on **01/16/2004**. It is noted, however, that applicant has not filed a certified copy of the **2004-9904** application as required by 35 U.S.C. 119(b).

Drawings

5. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because **the drawings are unclear and the details are not legible**.

Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Information Disclosure Statement

6. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other

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information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered. Applicant makes reference to Japanese Patent Application Laid Open No. 2003-236929 on Page 1 of the Specifications under Background Art but has failed to include the reference on the IDS.

Specification

7. The disclosure is objected to because of the following informalities: the use of the phrase "to fine" is objected as non-idiomatic. While applicant explains in the specifications that the term "fine" means "to scale down" the pattern, it would be more appropriate to substitute the term "fine" with the phrase "scale down".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over URAIRI et al (JP 2003-236929) in view of ZHAO et al (Fabrication of Microstructures Using Shrinkable Polystyrene Films).

12. **With regards to claim 1**, URAIRI discloses a method of applying a pulse laser beam to a plastic exhibiting a glass phase transition by heating for forming an induced structure part (pattern) (Page 4 [0009], [0010], Page 9 [0027] Applicant's Specifications Page 1 Background Art).

13. However, URAIRI does not disclose a method step of heat treating the plastic material to be processed at a temperature not lower than a glass transition temperature T_g to fine (scale down) the formed patterns by heat shrinkage.

14. ZHAO, discloses a method to reduce the feature size (fine) of microstructures and to fabricate microstructures of various materials by heating the patterned film to a

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temperature a few degrees above the glass transition temperature (Page 209, Section I. Introduction)

15. At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to have modified the method of URAIRI to include the temperature of ZHAO because it allows the thermal shrinkage of patterned polystyrene (plastic) films which provides the basis for a wide flexibility of patterns produced (Page 215, Section 4 Conclusion).

16. **With regards to claim 2**, URAIRA discloses a method in which a plastic material to be processed has a formed laser processed pattern.

17. ZHAO discloses a method in which the formed laser processed pattern is not lost by heat treatment (Page 212, Section 3.2, and Figure 3).

18. **With regards to claim 3**, URAIRI discloses a method of applying a pulse laser beam to a plastic exhibiting a glass phase transition by heating for forming an induced structure part (pattern).

19. However URAIRI does not disclose a method in which the formed laser process pattern is only fined by the heat treatment without its shape changing.

20. ZHOA discloses that a rectangular shape was change during shrinking to either a rectangular or rhombic shape depending on the alignment (Page 212, Section 3.2, and Figure 3). However ZHOA further discloses that complex shapes can be fabricated by controlling the extent and direction of the shrinkage of the patterned PS films (Page 215, Section 4. Conclusion).

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21. **With regards to claim 4**, URAIRI discloses a method of applying a pulse laser beam to a plastic exhibiting a glass phase transition by heating for forming an induced structure part (pattern) However URAIRI, does not disclose a method of heat treating the plastic material to be processed at a temperature (T) equal to or great than the T_g and equal to or lower than 200°C + T_g ($T_g \leq T \leq T_g + 200^\circ\text{C}$).

22. ZHOA discloses a method in which polystyrene (plastic material to be heat treated) is heat treated at a temperature (110°C) a few degrees above the glass transition temperature of the polystyrene (T_g = 100°C) (Page 209, Section I. Introduction).

23. **With regards to claim 5**, URAIRI discloses a method in which the method is carried out while focusing a light beam (Page 5, Paragraph [0011]) so as to have a beam spot size of the pulse laser beam at the position for processing the plastic material to be processed of between 0.1- 100µm (Page 12 Paragraph [0034], Page 15 Paragraph [0047]).

24. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over URAIRI et al (JP 2003-236929) as modified by ZHAO et al (Fabrication of Microstructures Using Shrinkable Polystyrene Films) in further view of MISAWA et al (Microfabrication by Femtosecond Laser Irradiation).

25. **With respect to claim 6**, modified URAIRI discloses a method of applying a pulse laser beam to a plastic exhibiting a glass phase transition by heating for forming an induced structure part (pattern) (URAIRI Page 4 [0009], [0010], Page 9 [0027]

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Applicant's Specifications Page 1 Background Art), heating the patterned film to a temperature a few degrees above the glass transition temperature (ZHAO Page 209, Section I. Introduction) and the use of a lens that provides a magnification of 10 times or 20 times (URAIRI Page 18 Paragraphs [0053], [0055]).

26. However URAIRI does not disclose the use of an objective lens of 0.1 to 1.4 numerical aperture.

27. MISAWA discloses a method of laser microfabrication in which an objective lens with a numerical aperture of 1.3 is used.

28. At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the method of URAIRI to include the lens numerical aperture of MISAWA because adjusting the numerical lens aperture determines how the pulse is focused, for example a tightly focused pulse has a $NA > 0.6$ (Page 248, Section 2.2 Optical Damage).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHANIE DUCLAIR whose telephone number is (571)270-5502. The examiner can normally be reached on Monday - Friday, 8:00AM - 4:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on 571-272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. D./
Examiner, Art Unit 4171

/Diana Dudash/
Primary Examiner